

A NEW SUBSPECIES OF *CROTALUS LEPIDUS* FROM WESTERN MEXICO

Wilmer W. Tanner,¹ James R. Dixon,² and Herbert S. Harris, Jr.³

ABSTRACT.— An examination of additional specimens of *Crotalus lepidus* from western Durango and the adjacent parts of Sinaloa and Nayarit have demonstrated the validity of Klauber's (1956) suggestion that a new subspecies may occur. The new subspecies (*C. l. maculosus*) is described and compared to other subspecies.

Klauber (1956:37) recognized the uniqueness of three specimens of *Crotalus lepidus* from areas near the junction of the Mexican States of Durango, Sinaloa, and Nayarit. Although *lepidus* from that area were considered to belong to the subspecies *klauberi*, or were at least in the designated range for that subspecies, Klauber keyed such specimens to the subspecies *lepidus* or *morulus* and suggested that an adequate series from this rough and inaccessible area might justify the recognition of a new subspecies.

The area northwest, west, and southwest of El Salto, Durango, is some of the most rugged terrain in Mexico. In this area with its deep canyons, high ranges, plateaus, and its diverse climate ranging from wet to dry, there has been produced a variable and challenging environment which has seemingly been responsible for the development through adaptation of a number of subspecies. Perhaps of equal importance in this study is the fact that within this general area at the higher elevations are found some of the more primitive members of the genus *Crotalus*. It is not, therefore, surprising to find a population of *C. lepidus* which has, in its adaptation to this area, developed a series of unique characteristics.

We now have available a series of 19 specimens from these states and consider them to be sufficiently distinct to warrant a description of a new subspecies. Because of the distinctive character of the series of small dorsal spots we choose to name it

Crotalus lepidus maculosus, subsp. nov.

TYPE.— BYU No. 33328, 15 miles (24 km) west of La Ciudad, near Highway 40, Durango, Mexico. An adult male collected on 31 July 1970 by Richard T. Basey.

PARATYPES.— BYU 40188, 1 km W Los Bancos, HSH 71-24 and HSH 71-133, near La Ciudad, MVZ 59310, 16 miles (22 km) SW La Ciudad and UCM 46011, 11 miles W La Ciudad, Durango; TCWC 33358, 2 days by mule E from Huajicori, Nayarit; BYU 40189, Puerto El Alazan, BYU 40190-91, 3 miles E Puerto El Alazan, HSH 71-23, 10 miles W Durango-Sinaloa line (Hwy 40), KU 78973, 19.2 km NE Santa Lucia, KU 79232, 5 km SW Palmito,

¹Department of Zoology, Brigham Young University, Provo, Utah 84601.

²Department of Wildlife Science, Texas A & M University, College Station, Texas 77843.

³The Natural History Society of Maryland, Baltimore, Md. 21218.

LACM 50960, 4.8 miles E Santa Rita (Hwy 40), TCWC 33354-6 Rancho Carrizo 12.5 miles (20 km) W Palmito, TCWC 33357, 2 miles (3 km) W Palmito and TCWC 33359, near El Maguey (Eastward from Huajicori), Sinaloa, Mexico.

DIAGNOSIS.—A medium to small subspecies of *lepidus* differing from other subspecies in having a dorsal series of small spots often longer than wide and in a primary series averaging 29-31 spots. It also differs from other subspecies in that the dorsal spots do not extend laterally on each side of the body to form cross bars, except near the tail where the spots may form moderate cross bars (Fig. 1). *C. l. maculosus* differs from *klauberi* and *lepidus* in having an increase in the average number of ventrals and caudals, and from *klauberi* in that the ground color is heavily pigmented between the spots, a character shared with *lepidus* and *morulus*. It is further distinguished from *klauberi* by the heavy flecking on the ventrals, reduced number of scales between the supraoccipitals, presence of a postocular stripe, reduction in number of scales in internasal-prefrontal area, and by its smaller size.

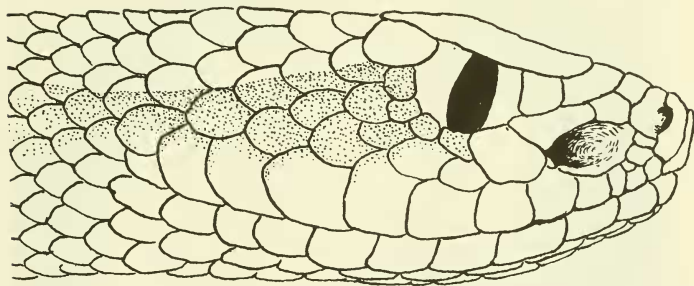


Fig. 1. Lateral view of the head of the type (BYU 33328) showing loreals, anterior subocular and postocular stripe.

Crotalus l. maculosus shares with *lepidus* and *morulus* the dark ground color, postocular stripe and with *morulus* an increase in body spots, ventrals and caudals and paired occipital blotches. It is most distinct from *morulus* in that the upper preocular is divided and the anterior subocular is usually in contact with the upper labials.

DESCRIPTION OF TYPE.—An adult male, total length (snout to first rattle) 591 mm, tail (vent to first rattle) 56 mm, head length 26.2, head width 15.5, fang length 4.1, rattle small, lateral width of proximal rattle 2.5, dorsoventral depth 5.4; ratio of tail into total length 10.55 percent, head into body length 20.42, head into total length 22.56, fang into head length 6.39, and proximal rattle into head length, 4.76.

Scale rows on body 23-23-17, on tail at tenth caudal 12 rows, fringe scales around first rattle 10; ventrals 169, caudals 30, anal

complete; supralabials 12-13, infralabials 10-11; preoculars 2-2 elongate, upper one divided horizontally, postoculars 3-3, suboculars 2-2, anterior subocular round, enlarged and in contact with the orbit and the fourth and fifth supralabials; one row of interoculabials between postsubocular and supralabials; anterior nasal largest and in broad contact with first supralabial and internasal; loreal angular; three small prefoveals between loreal and first two supralabials; three small postfoveals along lower margin of pit and above third and fourth supralabials.

Rostral wider (3.8) than high (3.0), clearly visible from dorsal view, not deeply wedging between internasals; two internasals, not in contact with loreals and nearly twice as wide (2.7) as long (1.7), no canthal ridge on edge of internasals from snout to canthal; canthal large, approximately round and in contact with internasal, nasal, loreal, upper preocular, supraocular, and three intercanthals; four small scales (two rows) between canthals and posterior to internasals; supraoculars large and oblong, three rows of small scales between supraoculars near their middle, head scales posterior to interocular area smaller than those on anterior dorsal surface.

First pair of infralabials in broad contact on the midventral line, completely surrounding triangular mental and wedging posteriorly between genials; genials large, elongate, and in broad contact posteriorly, in contact with first three infralabials anteriorly, and wedging between gulars posteriorly; five gulars between genials and first ventral.

Dorsal pattern a series of 31 dark brown spots extending from head to tail; first spot (post temporal) divided and last four extended laterally to form broken or continuous transverse bars; spots often longer than wide and margined with a fine edging of light yellowish or golden brown; spots 2-3 scales long and 4-5 scale rows wide, becoming smaller posteriorly, until fusion with lateral spots forms bars. One row of lateral spots which becomes more obvious posteriorly and fuses with dorsal spots; no intermediate spots between primaries.

Ground color a dark brown, nearly uniform, but with some dark flecking particularly between the dorsal and lateral spots; venter heavily marbled with dark markings and flecks; head without marks on dorsum; a dark stripe from eye to temporal area; labials marbled, with less light markings on supralabials; snout a uniform dark brown.

Tail with one complete bar and four lateral spots on each side, dorsal area posterior to first bar light brown, noticeably lighter than dorsum of body; proximal rattle rust red.

VARIATIONS.— We have used freely the scale counts given by Gloyd (1940) and Klauber (1952 and 1956) in our analysis of the characters used in this study. Obviously, we have not deemed it necessary to recount specimens previously studied. We have, therefore, examined in detail only those specimens not previously examined with the exception of a few specimens from critical areas.

Twenty additional specimens of *klauberi* have been examined from Mexico—six from Chihuahua, seven from Durango, one from Jalisco, one from Nayarit, and five from Zacatecas. Variations from these fit well into the range of variations as established by Klauber (1956). In a few specimens there are variations worthy of note, such as the light color and color pattern of two specimens from 4 miles (6 km) N of La Campana (MSU 2831) and 3 miles (5 km) E of Conjos (MSU 3613), Durango. In both, the dorsal bars are faint or obsolete anteriorly and the ground color is a light cream or grey. We conclude that these specimens are western representatives of the *palmeri* population, which seemingly occurs in the desert basin between eastern Durango and east central Coahuila near the type locality of Monclova as established by Garman (1887). Specimens from central Chihuahua do not show this faded color indicating that the *palmeri* phase occurs only in the central desert region

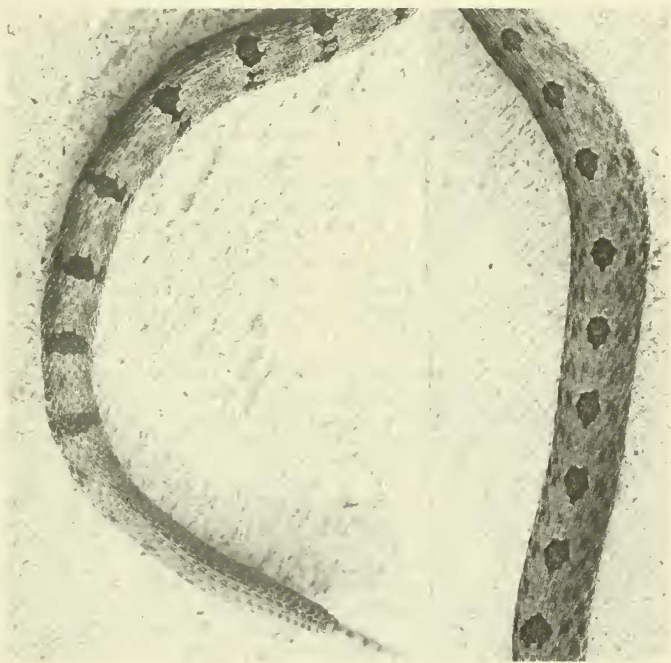


Fig. 2. Dorsal view of type specimen showing the dorsal spots at mid-body (left) and posterior of body and tail (right).

of these Mexican states. There are no unusual variations in the scale patterns of these specimens.

Taylor (1944) in an attempt to understand variations in this species applied the name *semicornutus* to a population of *lepidus* occurring in southwestern Chihuahua. We have seen additional specimens of this population and recognize it as a variant of *klauberi* but with the distinct possibility of having retained some of the *lepidus* characteristics such as a greater diffusion of spotting between the bars and with the accompanying reduction of the greenish ground color so evident in most *klauberi*.

A specimen (BYU 14244) taken 1.5 km W of Cerocouhui, Chihuahua, has the greenish color above and a shade of pink laterally which becomes more intense on the first two rows of dorsals and the tips of the ventrals. This pinkish color also occurred on the supraoculars and across the canthals to the rostral. The supraoculars are raised and extended giving them a very noticeable hornlike appearance and producing a concavity to the dorsum of the head. Both the color pattern and shape of the head plates were described by Klauber (1956) for populations of *klauberi* in southern Arizona. The influence of the Arizona populations apparently extends southward along the western slope of the Sierra Madre Occidental, but we have found no evidence of this influence occurring in *klauberi* on the eastern slope in Chihuahua and northern Durango.

We have seen no specimens between west central Chihuahua and west central Durango, a distance of approximately 350 km. In this area of the western slope, the ruggedness of the area does not change; however, there is a warming and an increase in precipitation from north to south. It is not surprising, therefore, for populations on the Pacific slopes of these mountains in western Durango, eastern Sinaloa, and northern Nayarit to show noticeable variations when compared to *lepidus* found on the drier eastern slope.

A summary of the comparative variations is listed in Tables 1 and 2.

Klauber (1956) recognized the variations in three specimens of *C. lepidus* taken near the Sinaloa-Durango-Nayarit border but was not able to differentiate them from other subspecies. We have seen one of these three specimens (SDSNH 45145) taken approximately 70 miles (112 km) W of El Salto by Darling. Although this specimen was collected in the area of *maculosus*, it is one of a few we have seen in which the anterior subocular does not contact a supralabial and has laterally extending dorsal spots. In other characters, it shows an increase in dorsal spots—28, the dark color on the venter and between the dorsal spots, and an increase in caudals.

A specimen from Santa Teresa, Nayarit (USNM 46333) also has many intergrading characteristics. There are only 21 body spots which form short bars and the ventrals (159) and caudals (21) are low. The color is dark, quite in contrast to *klauberi* and the fringe scales are reduced to 10 around a small rattle (5.5x2.5). Two specimens from near Coyotes, Durango, show indications of intergradation with *maculosus*. Their location near the continental

TABLE 1. Variations in the scale counts and numbers of body blotches in the subspecies of *Crotalus lepidus*.

Subspecies	Dorsal Scale Rows		Fringe Scales		Body Blotches		Ventral Scutes		Subcaudal Scutes	
							Males	Females	Males	Females
<i>lepidus</i> ¹	21-25	(23)			13-24	(18.6)	150-168	(161.7)	149-168	(161.1)
<i>klauberi</i> ¹	21-25	(23)	10-13	(11.4)	13-21	(17.3)	152-172	(161.7)	155-170	(162.1)
					14-21	(16.8) ²	160-170	(163.6) ²	157-161	(159.3) ²
<i>morulus</i> ¹	23-25	(23)			24-34	(29.2)	156-167	(159.9)	160-171	(163.8)
<i>maculosus</i>	23-25	(23)	8-12	(9.9)	26-38	(31.5)	159-169	(163.7)	157-173	(165.3)
					23-36	(30.7)			26-33	(29.6)

¹Data taken from Klauber's report, 1956.
²Data from specimens not seen by Klauber (Chihuahua and Durango, Mexico).

TABLE 2. Dimension and Pattern Variables in *lepidus* subspecies.

Subspecies	% tail to T.L.		Female	% of 1st Rattle to T.L.		Size of Adults	Occipital Spots		Ventral Pattern	
	Male						Paired	Joined	Dark	Light
1. <i>lepidus</i> ¹	8.6		7.1			440-770	X		X	
1. <i>klauberi</i> ¹	8.1		6.6	.014-.016	(.0145) ²	400-828		X		X
1. <i>morulus</i> ¹	9.0		7.2			400-720	X		X	
1. <i>maculosus</i>	9.4		7.4	0.0092-.0120	(.0103)	400-591	X		X	

¹Some data taken from Klauber (1956).
²Based on 10 specimens from Chihuahua, Durango, and Zacatecas.

divide east of El Salto is in the proximity of a probable area for intergradation. In these specimens, as in USNM 46333, the spots are large and fewer as in *klauberi*, although they do not involve as many lateral rows as in most *klauberi*. A suffusion of pigment between the dorsal spots and on the ventrals also reflects the approach to *maculosus*.

We concur with Klauber (1956) that this population appears to be more closely related to the more eastern subspecies than to the western subspecies *klauberi*. We recognize the subspecies *lepidus* as the most primitive group in the species and suspect that its earlier distribution extended south to include not only areas now occupied by *lepidus* but also areas in Zacatecas and adjacent Durango, Sinaloa, and Nayarit, which are now occupied by *klauberi*.

Present distributions indicate that *klauberi* has recently expanded its range by moving southward along the eastern slopes of the Sierra Madre Occidental. In so doing, it is possible that the range of *lepidus* was not only invaded but actually divided, leaving a small population on the western flank of the mountains. From this isolated population the new subspecies *maculosus* has been derived, perhaps in much the same way as *morulus* on the eastern edge of *lepidus*.

We consider *klauberi* to be of a more recent origin than *lepidus*. If this is not the case, then we must assume that *lepidus* moved south and then west at a much earlier date than *klauberi*. At any rate, we believe that it would be very difficult to understand the relationships of *maculosus* in its present distribution if *lepidus* did not precede *klauberi* in its distribution to the south and then have the more vigorous *klauberi* proceed to replace it, at the same time dividing its range, leaving a small pocket isolated on the Pacific slopes. Specimens seen from southern Chihuahua, central Durango, and Zacatecas show no indication that they have been strongly influenced by a *lepidus* gene flow and suggest that the southward thrust of *klauberi*



Fig. 3. A dorsolateral view of BYU 40188 (paratype) taken 1 km W Los Bancos, Durango, Mexico, by Mr. and Mrs. Thomas Walker, Sr., 28 Aug. 1968.

quite thoroughly replaced any previous *lepidus stock*. Only in the edges of the distribution do we find noticeable variations suggesting hybridization with other populations. It should also be noted that any intergradation occurring is toward the southern limits of distribution and therefore fits well our suggestion that the distribution of *lepidus* has in reality been divided by *klauberi*, thus isolating the population on the Pacific slopes and producing a biotic situation which permitted the adaptive development of *maculosus*.

At present the subspecies *maculosus* is confined to a rather narrow area extending along the high mountain slopes west of the continental divide in Durango-Sinaloa-Nayarit and perhaps as far south as adjacent northern Jalisco. Its habitat is one of rocky slopes high in the mountains and perhaps descending to the moderately low foothills of the Pacific slopes. Such a habitat is located in an area of greater rainfall than generally occurs in the areas occupied by the subspecies *lepidus* and *klauberi*. We suggest that such climatic conditions have contributed to the darker ground color in *maculosus* and perhaps also in *morulus*.

MATERIALS

Crotalus l. klauberi, BYU 13416, 2 miles W Colonia Juarez, BYU 14247, 15281-2, 5.5 miles NE Colonia Juarez, BYU 14244, 2 miles E Cerocouhui, BYU 16866, 25 miles SE Creel, Chihuahua; FMNH 1494 and HSH 71-261, Coyotes, USNM 46349, Guanacevi, HSH 71-231, 70-90 miles SW Torreon (Hwy 40), Durango; USNM 46472, Bolanos, Jalisco; USNM 46333, Santa Teresa, Nayarit; USNM 46354, Berriozabal, USNM 46470-1, Plateado, HSH 71-25 (alive) and HSI 1 R-784 Southern Zacatecas, Zacatecas, Mexico.

ACKNOWLEDGMENTS

We are most grateful to the many persons and institutions who have furnished us data and specimens. The senior author is particularly indebted to Mr. Richard T. Basey of Arcadia, California, for providing the type specimen and for information concerning other available specimens of *maculosus*. We are also indebted to Mr. Louis Pistoia, Curator of Reptiles, Columbus Zoological Gardens, Ohio, for the data provided on four live specimens and the loan of one other. Mr. Allan J. Sloan, San Diego Society of Natural History (SDSNH), was helpful in providing one of the three specimens seen by Klauber (1956) and in furnishing other pertinent information. Mr. Henry A. Molt also provided us data. The following have aided us by loaning specimens: Hymen Marx, Field Museum of Natural History (FMNH), William E. Duellman, Kansas University Museum of Natural History (KU), John Wright, Los Angeles County Museum (LACM), Rollin Baker, Michigan State University (MSU), Robert C. Stebbins, Museum of Vertebrate Zoology (MVZ), T. Paul Maslin, University of Colorado Museum (UCM), James A. Peters, United States National Museum (Smithsonian) (USNM), and our own institutions Brigham Young University (BYU), Natural

History Society of Maryland (HSH), and Texas A and M University (TCWC) for their continued courtesies. We also appreciate the data provided by Dr. Robert S. Simmons.

LITERATURE CITED

- GARMAN, S. W. 1887. Reptiles and Batrachians from Texas and Mexico. Bull. Essex Inst. 19:119-138.
- GLOYD, H. K. 1940. The Rattlesnakes, Genera *Sistrurus* and *Crotalus*. Chi. Acad. Sci., Spec. Pub. 4:280.
- KLAUBER, L. M. 1952. Taxonomic studies of the rattlesnakes of mainland Mexico. Bull. Zool. Soc. San Diego 26:1-143.
- . 1956. Rattlesnakes. University California Press. Vol. 1:1-708.
- TAYLOR, E. H. 1944. Two New Species of Crotalid Snakes from Mexico. Univ. of Kansas Sci. Bull. 30:47-56.